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Case Report

Emergency anaesthesia management in a patient with haemorrhagic shock and acute myocardial infarctus

Anaesthesia for haemorrhagic shock and acute myocardial infarctus

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Abstract
Acute myocardial infarction (AMI) occurring perioperatively is associated with significant morbidity and mortality. In patients with AMI during emergency surgery, the maintenance of cardiac stabilization is of the utmost importance during anesthesia. Here we report a case of the anaesthetic approach taken to a major trauma patient who required emergency surgery for hemorrhagic shock related to an open fracture of the tibia and active bleeding and was diagnosed with acute inferior myocardial infarctus.

Keywords
Myocardial infarction; Hemorrhagic shock; Anaesthesia

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Introduction

The primary aim of anaesthesia applied in the perioperative period to patients with acute myocardial infarctus (AMI) (Figure1, 2) is to protect the myocardial oxygen delivery-consumption balance [1]. The most appropriate approach in this situation is to reduce oxygen consumption to the minimum for metabolic requirements while keeping oxygen delivery at the highest level [2].

The oxygen requirement of the myocardium is regulated by heart rate, afterload, and contractility. Tachycardia (heart rate >90 bpm) causes ischaemia more than hypertension or hypotension [3,4]. To prevent an increase in myocardial ischaemia, increased oxygen consumption of the myocardium must be prevented as this leads to tachycardia, so increased wall stress must be avoided and sufficient coronary perfusion must be provided [2]. Therefore, hypoxia, hypotension, hypertension, and tachycardia must not be allowed to develop during anaesthesia induction [5].

In all major trauma patients, it must be considered that there could be head trauma and cervical injuries [6]. Reviews of the scientific literature have identified the key indications to intubate a trauma patient [7]. Furthermore, information may not be able to be obtained about the fasting status of patients who are unconscious and require emergency surgery. In these cases, it should be accepted that the patient has recently eaten and the patient should be intubated with rapid sequence intubation techniques. In rapid sequence intubation, the necessary preparations should be made for the use of potent sedative or induction agents with the addition of neuromuscular blocker application at the same time and the process can be completed with appropriate tracheal intubation [8].

In this case presentation, the anaesthesia approach is described for emergency surgery on a patient with major trauma because of a traffic accident within the vehicle, diagnosed with an open tibia fracture and concomitant acute inferior myocardial infarct. It was also aimed to discuss the points requiring attention during tracheal intubation of a major trauma patient and the steps which should be taken during the application of anaesthesia in AMI cases.

Case Report

A 50-year old male patient was brought to the Emergency Dept following a traffic accident within the vehicle. In the initial examination, the patient was generally confused with measurements determined as TA: 76/40 mmHg, pulse: 97/min, respiratory count: 22/min and saturation measured with pulse oximetry: 94%. A Philadelphia neck brace had been placed on the patient. Emergency surgical intervention was planned with the Orthopaedics Dept for a subtotal amputated open tibia fracture below the right knee and active bleeding. The laboratory test results were as follows: creatinine 1.5 mg/dL, ALT: 93U/L, AST: 93 U/L, WBC: 35000/µl, hemoglobin: 11.2 g/dL, and troponin: 0.698 ng/ml. With a diagnosis of acute inferior myocardial infarctus on the electrocardiograph (ECG), the patient was taken for emergency coronary angiography by the Cardiology Dept.

During the coronary angiography, TA was determined as 61/39 mmHg, so a dopamine infusion was started. An 0Rh (-) erythrocyte suspension continued to be taken. On the coronary angiography, the left main coronary artery (LMCA) was normal and on the left anterior descending (LAD) artery, 60% narrowing was seen in the D1 body, 80% narrowing after D1, followed by LAD with plaque and in the distal LAD there was 30%-40% narrowing and muscular bridge in the septal branch. The circumflex (CX) was reported as diffuse 90% narrowing after OM1, and in the right coronary artery (RCA), 70% thrombotic narrowing after the conus branch. As the patient's condition deteriorated during the procedure, after bleeding control was achieved at the end of the emergency orthopaedic operation, anti-aggregant treatment was started for the patient with a diagnosis of coronary artery disease and it was decided to evaluate in respect of revascularization. The patient was unconscious with respiratory problems when he was admitted to the emergency operating theatre for the active bleeding intervention. On admission for surgery, the patient was ASA IV E with TA 60/40, pulse 130/min and saturation 91%.

A left femoral central catheter was attached. As the patient had a Philadelphia neck brace, cranial and cervical imaging had not been able to be applied. The fasting status was not known, so it was accepted that the patient has recently eaten. After the administration of 10 mg rocuronium (IV) for priming, 4mg

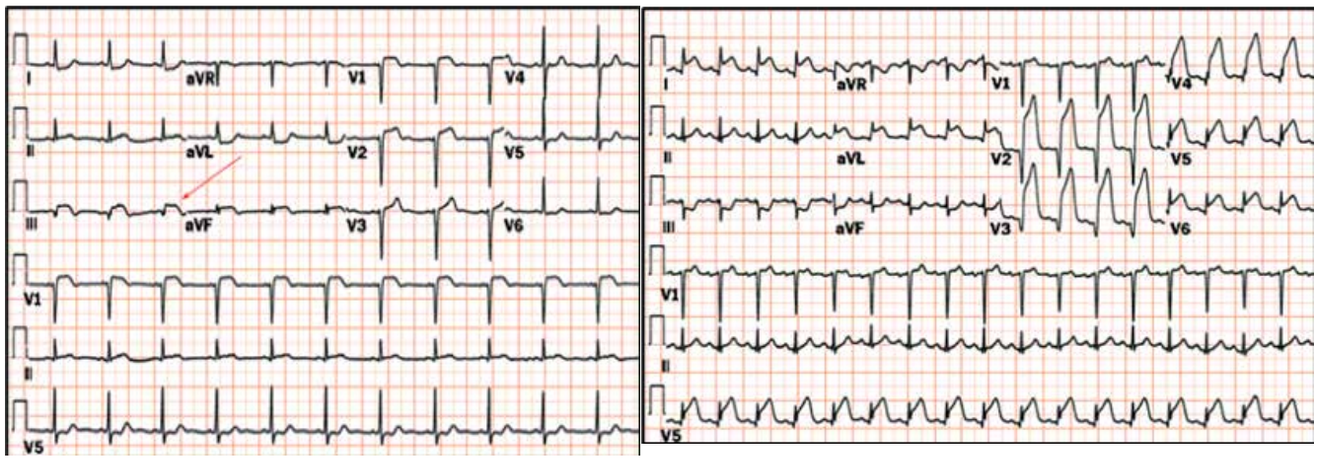

Figure 1. Acute inferior myocardial infarction; Acute anterior myocardial infarction.

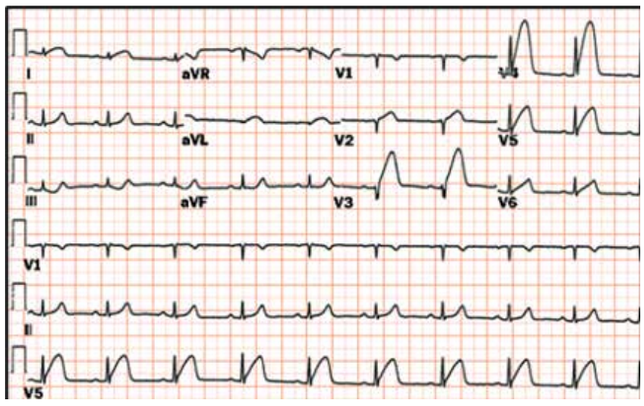

Figure 2. Acute anterolateral myocardial infarction

midazolam and 200mcg fentanyl were administered with the IV push route for induction. For neuromuscular blockage, 40mg rocuronium IV was added.

After the application of mask ventilation with 100% O2 for approximately 1 min, the manual in-line stabilisation (MILS) technique was applied with the help of the second and third assistants for cervical stabilisation, and by applying cricoid pressure against the possibility of aspiration, the patient was intubated with an 8mm ID balloon endotracheal tube. The Philadelphia neck brace was re-applied. Invasive and non-invasive blood pressure monitorisation, ECG, pulse oximetry and end-tidal CO2 monitorisation were performed and anaesthesia maintenance was made with 1% sevoflurane in 50% air + 50% O2. After intubation, TA was measured as 64/44 mmHg and pulse as 133/min. As the blood group of the patient was unknown, 0Rh (-) erythrocyte suspension replacement was continued together with hydration and dopamine infusion.

After the operation, which lasted approximately 3 hours, the patient was transferred to the Intensive Care Unit (ICU), still intubated. Postoperatively, as hemoglobin was 5.1 g/dL, 3 Units of erythrocyte suspension replacement were administered. On the recommendation of the Cardiology Dept, treatment was started of 100 mg acetylsalicylic acid 1x1, clopidogrel 75 mg 1x1, and enoxaparin sodium 0.6 cc 1x1. On the following day, coronary angiography was applied by the Cardiology Dept and a stent was placed in the RCA. After that procedure, follow-up continued in the ICU.

Discussion

Coronary artery disease is one of the leading causes of death in many countries [9]. In patients who have experienced AMI, revascularization must be applied without delay. Fibrinolytic treatment or a percutaneous coronary intervention (PCI) is preferred for revascularization. If PCI cannot be applied by an experienced team within the first 20 mins of the onset of symptoms, it is recommended that fibrinolytic treatment is initiated [10-12]. If the reperfusion treatment is PCI, treatment should be started within 90 mins of the first medical contact. In high-risk patients with large anterior infarct and in those who present early within 2 hours, this period should be ≤ 60 mins [10-12]. Operating and the application of anaesthesia is extremely rare for a reason other than revascularisation of a patient who has experienced AMI. In such cases, however, there must be correct prioritization of the coronary revascularization and the non-cardiac surgical intervention. For coronary revascularisation, there must be a timely intervention that should not be delayed. In the current case, fibrinolytic treatment was not applied so that the emergency surgery could be performed, and immediately after diagnosis, emergency coronary angiography was applied by the Cardiology Dept.

During the application of anesthesia to patients who have experienced myocardial infarct, ensuring that the infarct area remains limited as far as possible and preventing the formation of new infarcts both intraoperatively and postoperatively must be taken into consideration. Perioperative and postoperative deaths can be caused by an imbalance in myocardial oxygen delivery and consumption and the deepening of myocardial ischemia. In cases with myocardial ischemia, the aim of treatment is to reduce myocardial oxygen consumption and increase oxygen delivery. In this imbalance, tachycardia, hypervolemia, and anemia are the most important correctable factors [13]. Furthermore, the most effective method in reducing AMI-related morbidity and mortality has been reported to be close hemodynamic monitoring and timely intervention to hemodynamic changes that occur [14]. Therefore, it is of the utmost importance to prevent the development of hypoxia, hypertension, hypotension, and tachycardia so that they do not cause acute hemodynamic changes and myocardial oxygen delivery-consumption imbalance. Benzodiazepines are recommended as agents in the induction of these patients as they do not create significant hemodynamic changes and because of the effects such as the reductions of doses of hypnotic agents such as pentothal and propofol that cause hypotension [15, 16]. Opioids are often used in the inhibition of the hyperdynamic response to anesthetic induction. Opioids show a vagal effect by reducing the sympathetic output from the central nervous system. Fentanyl and analogs, which do not lead to histamine expression, are most often used for this purpose. Opioids that do not cause histamine expression (fentanyl, alfentanil, sufentanil, remifentanil) do not lead to a reduction in systemic vascular resistance and therefore hypotension is not observed [2]. Ketamine, which is used as an induction agent in many patients because of hypotension, increases cardiac flow, heart rate and pulmonary artery pressure because of the central sympathomimetic properties and by increasing oxygen consumption it can cause myocardial ischemia [17]. In the facilitation of endotracheal intubation, succinylcholine, which is usually selected for rapid intubation, is a muscle relaxant which can cause blood pressure and heart rate changes by stimulating not only the nicotinic receptors in the nerve-muscle junction but also the nicotinic receptors in the parasympathetic and sympathetic ganglia and the muscarinic receptors in the sinoatrial node [18]. In this respect, with opioids and rocuronium at appropriate doses protecting against tachycardia and the use of oxygen, laryngoscopy and tracheal intubation can be achieved [2]. In a case report by Kararmaz et al, a patient with AMI who was to undergo emergency non-cardiac surgery was administered anesthesia induction with midazolam, fentanyl, low-dose propofol, and vecuronium and endotracheal intubation was achieved [1]. If there is known or suspected cervical spine injury in major trauma patients, excessive movement of the spine that could lead to spinal cord injury

must be avoided. To achieve this, while one person over the cervical spine can help to provide immobilization, another can safely and successfully apply endotracheal intubation [7].

However, an unconscious patient brought to the operating theatre should be accepted as having recently eaten and rapid, sequence intubation should be applied. Rapid sequence intubation is an airway opening method that can be safely applied to patients in life-threatening conditions because of medical emergency situations [8]. The use of induction agents at the same time as neuromuscular blocking agents aims to provide safe conditions for endotracheal intubation. In the current case, in accordance with the information stated above, while the dopamine infusion was continued, induction was applied with midazolam and fentanyl and priming with rocuronium. By applying cricoid pressure and the manual in-line stabilization technique with the help of 2 people, intubation was achieved without any problems.

In anesthesia maintenance of patients with myocardial ischemia, sevoflurane can be used as this has been shown to have a reducing effect on the incidence of myocardial infarctus and on postoperative mortality following cardiac surgery [19]. Furthermore, sevoflurane is an appropriate agent to use in anesthesia maintenance as it does not create tachycardia and provides deep anesthesia in the short-term [20]. In a study by Rao et al, it was reported that general anesthesia provided with nitrogen protoxide increased the incidence of perioperative AMI [21]. In the current case, nitrogen protoxide was not used, but with the use of sevoflurane together with an air and oxygen mixture, anesthesia maintenance was provided without any deterioration of the patient's hemodynamics.

Conclusion

In the case presented here, anesthesia induction was made with midazolam, fentanyl and rocuronium and maintenance with sevoflurane to a patient with AMI in hemorrhagic shock. With this method, sufficient oxygen delivery can be provided with minimal hemodynamic change, and as there could be many factors together in major trauma patients which make the anesthetist's work more difficult, such as the patients who have recently eaten, the possibility of head and cervical trauma, and hemodynamic deterioration associated with hemorrhage, it is necessary for the balances to be very well protected in these negative conditions.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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